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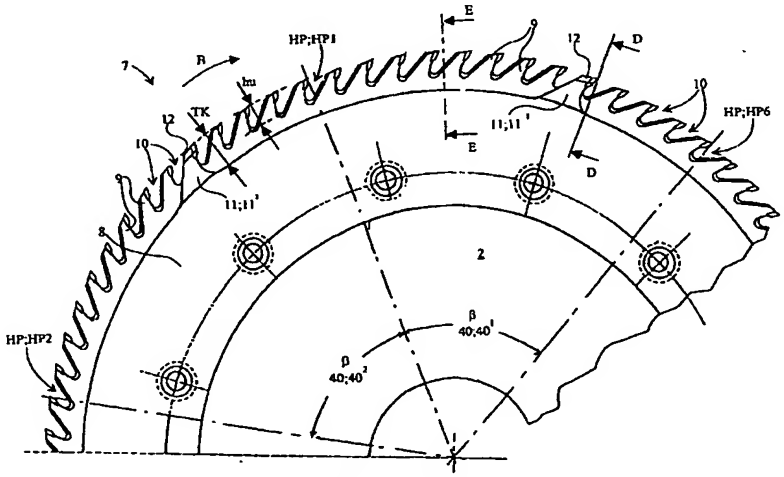
(54) Title: CUTTING HEAD FOR CHIPPING CANTER



(57) Abstract: The invention relates to the cutter head (7) of a chipper canter, comprising a frame, a plurality of chipping blades, which are disposed peripherically in connection with the frame at mutual distances, and a circular blade (8), which is mounted in connection with the frame in the vicintity if the chipping blade. The cutter head (7) of the invention also comprises a dressing means (11), whose cutting knife portion (12) is disposed on the saw line of the circular blade (8), the width of the knife portion (12) in a plance perpendicular to the direction of rotation of the circular blade (8) being greater than the width of the teeth (9) of the circular blade in the corresponding plane, and the dressing means (11) being disposed to cooperate with the circular blade (8) for at least partial enlargement of the kerf produced with the circular blade in the wood to be processed. The dressing means (11) is used to enlarge the kerf is being formed. Thus a path is provided for the sawdust discharged from the kerf.

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Cutter Head for Chipping Canter

The invention relates to the cutter head of a chipping canter as defined in the preamble of claim 1.

The operations performed in the chipping canter line of a sawmill comprise dressing and chipping of the opposite sides of a piece of wood to be processed, such as a log or a cant, into plane surfaces by means of a chipping canter, followed by the actual sawing of the log or the cant. We refer to FI patent specification 73378, for instance.

A prior art cutter head of a chipping canter is shown in figures 1 and 2 of the drawing, and its operation is illustrated in figure 3. The cutter head 1 of the chipping canter includes a frame 2 and a plurality of chipping blades 3; 3^1, 3^2, 3^3, 3^4, 3^5, 3^6. The chipping blades 3 are disposed in connection with the frame 2. They are fastened peripherically on the border area of the frame 2 and are spaced by regular mutual intervals. In this case, the chipping blades 3; 3^1, 3^2, 3^3, 3^4, 3^5, 3^6 are arranged at 60 ° angular distances on the outer periphery of the frame 2. In addition, the cutter head 1 comprises a circular blade 4 disposed in connection with the frame 2 in the vicinity of the chipping blades 3. The cutter head 1 is rotated from the shaft by means of any suitable actuator, such as an electric motor (not represented in the drawings).

The circular blade 4 is removably fastened to the frame 2. The chipping blades 3, in turn, are also fastened removably to the outer periphery 2a of the frame 2 with their blade edges extending to the vicinity of the teeth 5 of the circular blade 4, as illustrated in figure 3. The circular blade 4 and the chipping blades 3 rotate in direction B at the same rotating speed. The circular blade 4 acts as a surface blade, which leaves a kerf in the surface of the cant or the spar without slitting the wood. The chipping blades 3, in turn, are used to cut chip pieces from the wood material on the other side of the kerf. The revolution pattern 30 described by the chipping blades 3 is partly shown in figure 2.

Two cutter heads 1 are disposed facing each other at an adjustable mutual distance in the chipping canter line. The cutter heads 1 are operated in the same direction with suitable prime movers, such as electric motors. The piece of wood to be

processed is run between the cutter heads 1 with its opposite sides dressed simultaneously.

Conventional chipping canters have the drawback of limited speed of feeding a log. When the cutting speed of the chipping blades exceed a given limit value, the chip pieces are split into pin-like pieces, and then the chip properties are notably degraded particularly in view of pulp production. The price paid by pulp mills for wood chips of poor quality is clearly lower than the price paid for chips of good quality. The cutting rate limit mentioned above depends on the wood species and its state (dry, wet or icy).

An obvious solution to the problem described above is to extend the chip length, which allows the rate of feeding a piece of timber to be increased accordingly. However, this entails new problems, given that, as the length dimension of the chip pieces increases, the circular blade included in the cutter head cuts deeper into the wood, making it more difficult to remove sawdust from the slots between the teeth of the circular blade. The circular blade will consequently be jammed, which results at least in impaired saw surface quality, and even breakage of the circular blade in the extreme case.

The problem described above is illustrated by the following example. We refer to figure 3 in particular. For the saw cut left by the circular blade 4 of the cutter head 1 in the wood material P to be smooth and of good quality, the occlusion of the circular blade teeth 5 (feed/tooth) should be sufficiently small, preferably 2 mm or less. Accordingly, there must be room for at least thirteen teeth 5 in the circular blade sector 40; 40^1 between two consecutive chipping blades 3; 3^1, 3^2, with the depth L of the kerf U (and the related chip length l) being 26 mm. It should also be noted that the tooth 5 of the circular blade should extend in front of the chipping edge 3; 3^1, 3^2 in each circular blade sector 40; 40^1, to prevent the chipping blade 3 from slitting holes in the wood material P on the other side of the circular blade, not even at knots. In other words, there must be a remaining kerf U when the chipping blade 3 has cut a chip piece P1 from the wood, i.e. the ratio of kerf depth L to chip length is $L > 1$. Moreover, the gullet 6 between the teeth 5 of the circular blade should extend to a depth such that sawdust can leave the kerf U and the gullet of the circular blade 4 into the free space on the chipping blade 3 side (arrow C, figure 3) during the entire cutting operation. The tooth height and the occlusion of the circular blade 4 being high, there is not enough room for the amount of sawdust produced during dressing to escape through the clogged gullets 6 at the rear end of

the circular blade and chipping blade sector 40. In an attempt to solve the problem linearly, the teeth 5 of the circular blade are increased in length h and number in the circular blade sector 40 between the chipping blades 3. This, again, involves the problem of the teeth 5 having a height and a number such that their strength and rigidity are no longer sufficient, so that they tend to break during use.

The object of the invention is to eliminate the drawbacks relating to the cutter head of a chipping canter as described above. Another object of the invention is to provide a new cutter head for a chipping canter.

The cutter head of a chipping canter of the invention is characterised by the features defined in claim 1. The dependent claims define preferred embodiments of the invention.

The cutter head of the chipping canter of the invention comprises a frame, a plurality of chipping blades disposed peripherically at mutual intervals in connection with the frame, and a circular blade disposed in connection with the frame in the vicinity of the chipping blades. In accordance with the invention, the cutter blade also comprises a dressing means, whose cutting knife portion has been disposed in the saw line of the circular blade, the width of the cutting knife portion in a plane perpendicular to the direction of rotation of the circular blade being greater than the width of the circular blade teeth in the corresponding plane, the dressing means having been adapted to co-operate with the circular blade in order to at least partly enlarge the kerf produced with the circular blade in the wood to be processed.

The inventive idea consists in the kerf being enlarged with the dressing means at the same time as the kerf is formed with the circular blade. This yields the benefit of providing a broad path for the sawdust discharged from the kerf.

In the most preferred embodiment of the invention, the knife portion of the dressing means has a cutting blade edge that is tilted in a plane perpendicular to the direction of rotation of the circular blade and tilted especially to the chipping blade side, the blade edge serving to enlarge the mouth of the kerf.

In the embodiment of the invention described above, the dressing means is used particularly to enlarge the mouth of the kerf while the kerf is being formed. In this conjunction, the wedge-like wood tip of the chip piece to be cut with the chipping

blade is preferably shortened by the length of the blade edge, which is enough to ensure a passage for the sawdust discharged from the kerf.

The invention also has the advantage of allowing the teeth of the circular blade to be shortened relative to the previous tooth length. On principle, the height of the teeth can be reduced by the length of the blade edge of the dressing means, the wood tip of the chip piece being consequently shortened by this length. A circular blade formed in this manner will be resistant and efficient.

Owing to the invention, the teeth of the circular blade can be increased in number in the circular blade sector between the chipping blades, compared to prior art solutions. A circular blade sector of the same size can accommodate a larger number of low teeth than in prior art solutions.

Optionally, the number of chipping blades can be increased, and at the same time their angular distance and the central angle of the sector can be decreased, so that the circular blade sector still can receive the same number of teeth as before.

Both the cases described above have the advantage of allowing the speed of rotation of the cutter head, and consequently also the feed rate of the processed wood, to be increased more than before.

As an option to or besides the advantage described above, the quality of the dressed cant sides can be improved since the number of teeth in the circular blade sector can be increased from the previous number over the angular distance used between the chipping blades.

The invention has the additional advantage of allowing the chip length of the chips cut with the cutter head to be increased. Additional teeth can be inserted between the chipping blades in the circular blade sector, and thus the depth of the kerf can also be increased along with the increased occlusion of the teeth.

The invention also has the advantage of allowing the kerf cut with the circular blade to be narrowed. Since the teeth of the circular blade are low, they are preferably also thin, and then the kerf will also be narrow. Generally speaking, the kerf is narrower than in conventional cutter heads. This also yields the benefit of the wood portion lost during the cutting of the tip portion of the chip piece being compensated by the narrow kerf.

The invention is explained in detail below with reference to the accompanying drawing, in which

figure 1 is a side view of a prior art cutter head of a chipping canter;

figure 2 shows the cutter head of figure 1 in partial cross-section A-A;

figure 3 shows the operation of a prior art cutter head in schematic and partial cross-section;

figure 4 is a side view of a circular blade, i.e. a part of the cutter head of the chipping canter of the invention;

figure 5 shows the dressing means in the circular blade of figure 4 in partial cross-section D-D;

figure 6 shows the tooth of the circular blade in partial cross-section E- E at the cutter head of figure 4;

figure 7 shows the operation of the cutter head of the invention in schematic partial cross-section at a first stage; and

figure 8 shows the operation of the cutter head of the invention in schematic partial cross-section at a second stage.

The same reference numerals are used in the figures for corresponding parts.

Figures 1, 2 and 3 of the drawing have been discussed above in connection with the description of the prior art cutter head of a chipping canter.

Figure 4 illustrates a part of the cutter head 7 of the chipping canter of the invention. The cutter head 7 has the same parts as the prior art cutter head 1 in figures 1 and 2. The cutter head 7 comprises a frame 2, a plurality of chipping blades 3; 3^1, 3^2, which are disposed peripherically on the border area of the frame 2 at mutual intervals. The circular blade 8 is disposed in connection with the frame 2. The circular blade 8 and the chipping blades 3; 3^1, 3^2 are disposed at appropriately short

mutual intervals, in principle in the same manner as in the conventional cutter head in figures 1 and 2.

The basic structure of the circular blade 8 is identical to that of the conventional circular blade 4. The circumference of the circular blade 8 has a plurality of teeth 9, spaced by gullets 10. The locations of three consecutive chipping blades 3; 3^1, 3^2, 3^6 are schematically indicated only with arrows HP; HP1, HP2, HP6 in figure 4 (similarly also in figure 1 for the sake of illustration). Between the cutting blades 3; 3^1, 3^2, a given number of teeth 9 are disposed in the circular blade sector 40; 40^1, 40^2, thirteen teeth in this embodiment, which perform the forming of the kerf U in the wood material P.

In accordance with the invention, a dressing means 11; 11^1, 11^2 is disposed in connection with the cutter head 7, with its cutting knife portion 12 disposed on the saw line of the circular blade 8, i.e. in the plane of the circular blade, on level with its teeth. The width TE of the knife portion 12 of the dressing means 11 in a plane perpendicular to the direction of rotation B of the circular blade 8 is greater than the width T of the circular blade teeth 9. The dressing means 11 is disposed to cooperate with the circular blade 8 for at least partial enlargement of the kerf U produced by means of the circular blade in the processed wood P.

In the most preferred embodiment of the invention, figure 5, the knife portion 12 of the dressing means 11; 11^1, 11^2 comprises a cutting blade edge 12a, which is at an angle α in the range of 0 ° to 75 °, preferably 45 °, in a plane perpendicular to the direction of rotation. In addition, the angle α is on the side of the cutting edges 3 especially when it is above 0 °. This blade edge 12a is especially used to enlarge the mouth SU of the kerf U, as schematically shown in figure 8. The length S and angle α of the cutting blade edge 12a are optional. They also depend on the width TE of the dressing means 11.

One or more dressing means 11 can be disposed in connection with the circular blade 8. Most preferably, one facing blade 11; 11^1, 11^2 is disposed between the chipping blades HP1, HP2 (cf. chipping blades 3; 3^1, 3^2 in figure 1), in each circular blade sector 40; 40^1, 40^2.

The dressing means 11 is preferably mounted on the circular blade 8. Then the dressing means 11 is most preferably formed as an additional tooth of the circular blade 8, such as is schematically shown for instance in figures 4 and 5.

The height TK of the dressing means 11 in the radial direction of the circular blade 8 is greater than the height hu of the teeth 9 of the circular blade (cf. figure 4). The height hu of the teeth 9 of the circular blade 8 in the radial direction is preferably smaller than the tooth height h of the circular blade 4 of a conventional cutter head. The teeth 9 have then been shortened relative to the previous tooth length h. The height hu of the teeth 9 has been reduced relative to the previous height h at the most by the length S of the blade edge 12a of the knife portion 12 (cf. figure 7). The wood tip K of the chip piece is shortened by said length S, and it also corresponds to the enlargement of the kerf U in the mouth SU.

The dressing means 11; 11^1, 11^2 is most preferably disposed in connection with the circular blade 8 so as to be located in the central area of each sector 40; 40^1, 40^2 at a suitable angular distance β from and after a suitable number of teeth 9, such as four, from the preceding chipping blade 3; 3^1, 3^2. The angular distance β has been selected such that the depth of the kerf U1 at this stage of sawing equals at least nearly the length S of the blade edge 12a. Then the kerf U1 is enlarged by bevelling its chipping blade 3 side by means of the blade edge 12a of the dressing means 11 (cf. figure 7).

The operation of the cutter head 7 of the invention, especially that of the circular blade 8, the dressing means 11 and the chipping blade 3, is illustrated by figures 7 and 8. After the chip piece has been removed, the teeth 9 in each sector 40 of the circular blade 8 resume cutting a kerf U in the wood P. The dressing means 11 in the central area of the sector 40 enlarges the kerf U1 produced by the teeth 9 by bevelling with the blade edge 12a the chipping blade side of the kerf U1, as shown with a broken line in figure 7. The tip portion K of the chip piece P2 is thus cut off by bevelling. At this stage, the sawdust formed can be freely discharged from the kerf U1 in the direction of arrow E to the chipping blade side of the circular blade 8 and the dressing means 11. When the kerf U has been cut to its maximum depth, and the circular blade 8 has rotated to the final stage of the sector 40, the chipping blade 3 detaches a chip piece P2 from the wood material P, as schematically shown in figure 8. The tip portion of the chip piece P2 has a bevelled surface V and the kerf U has been enlarged at the mouth SU at the stage in figure 7 above, so that the sawdust is still allowed to be freely discharged from the kerf U in the direction of arrow F to the chipping blade side of the circular blade 8.

The invention is not confined to the mere embodiment example given above, but a variety of embodiments are conceivable without departing from the scope of the inventive idea defined in the claims.

Claims

1. The cutter head (1; 7) of a chipping canter, comprising a frame (2), a plurality of chipping blades (3), which are disposed peripherically in connection with the frame (2) at mutual distances, and a circular blade (4; 8), which is mounted in connection with the frame (2) in the vicinity of the chipping blades (3), **characterised** in that the cutter head (7) has a dressing means (11), whose cutting knife portion (12) is disposed on the saw line of the circular blade (8), the width (TE) of the knife portion (12) in a plane perpendicular to the direction of rotation of the circular blade (8) being greater than the width (T) of the teeth (9) of the circular blade in the corresponding plane, the dressing means (11) being disposed to co-operate with the circular blade (8) for at least partial enlargement of the kerf (U) produced by means of the circular blade in the wood material (P) to be processed.

2. The cutter head of a chipping canter as defined in claim 1, **characterised** in that the knife portion (12) of the dressing means (11) has a cutting blade edge (12a), which is at an angle (α) between 0 ° and 75 °, preferably of 45 °, in a plane perpendicular to the direction of rotation, the angle being preferably on the chipping blade side, and the mouth (SU) of the kerf (U) being enlarged by means of the blade edge (12a).

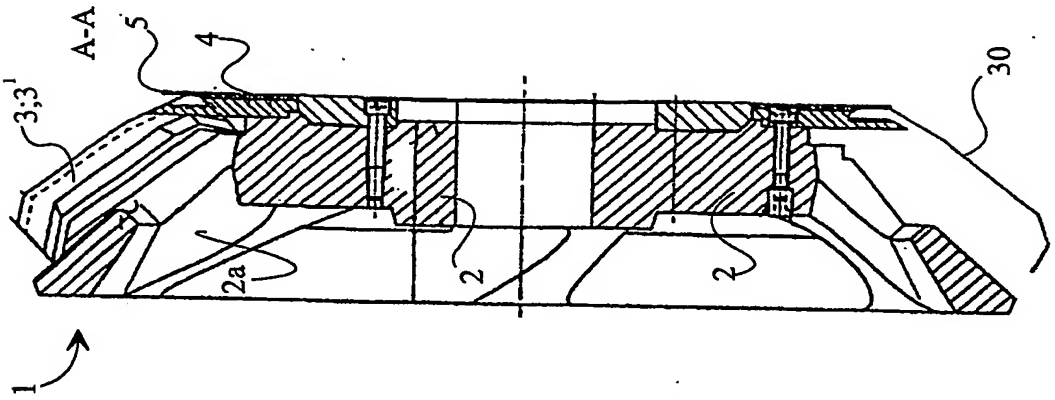
3. The cutter head of a chipping canter as defined in claim 1 or 2, **characterised** in that the dressing means (11; 11^1, 11^2) is disposed in each circular blade sector (40) between the chipping blades (3).

4. The cutter head of a chipping canter as defined in claim 1, 2 or 3, **characterised** in that the dressing means (11; 11^1, 11^2) is most preferably disposed in the central area of each sector (40; 40^1, 40^2) of the circular blade (8) at a suitable angular distance (β) from the preceding chipping blade (3; 3^1, 3^2).

5. The cutter head of a chipping canter as defined in any of the preceding claims, **characterised** in that the dressing means (11) is disposed in connection with the circular blade (8).

6. The cutter head of a chipping canter as defined in claim 5, **characterised** in that the dressing means (11) is formed as an additional tooth in the circular blade (8).

7. The cutter head of a chipping canter as defined in claim 5 or 6, **characterised** in that the height (TK) of the dressing means (11) in the radial direction of the circular blade (8) is larger than the height (hu) of the teeth (9) of the circular blade.


A-A
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4
3;3'
30
2a
2
2
1

Fig. 2

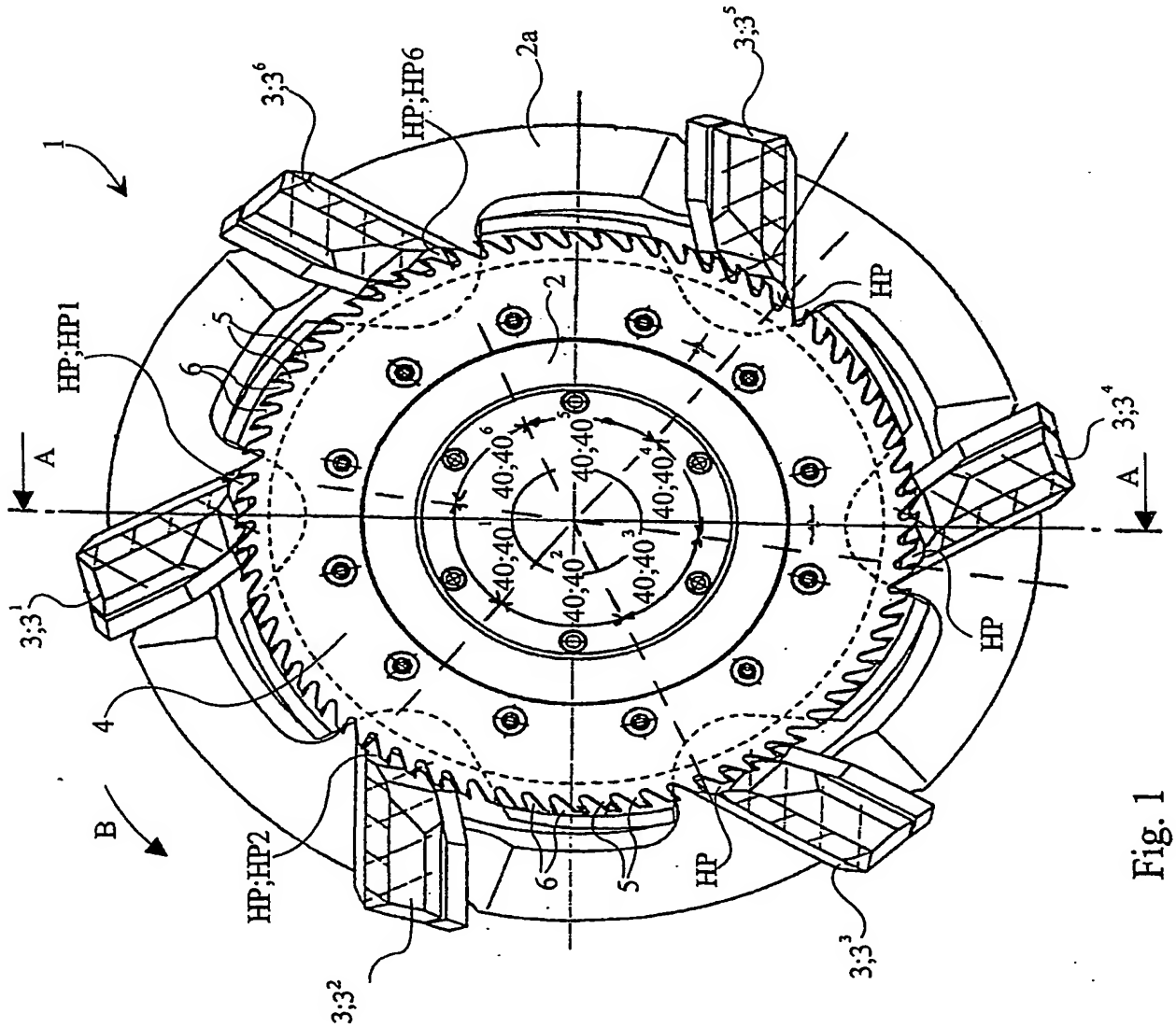
1
3;3⁶
HP;HP6
2a
3;3⁵
HP
HP;HP1
5
6
2
A
A
3;3⁴
40;40⁶
40;40⁵
40;40⁴
40;40¹
40;40²
40;40³
3;3¹
4
HP
B
HP;HP2
6
5
HP
3;3²
3;3³

Fig. 1

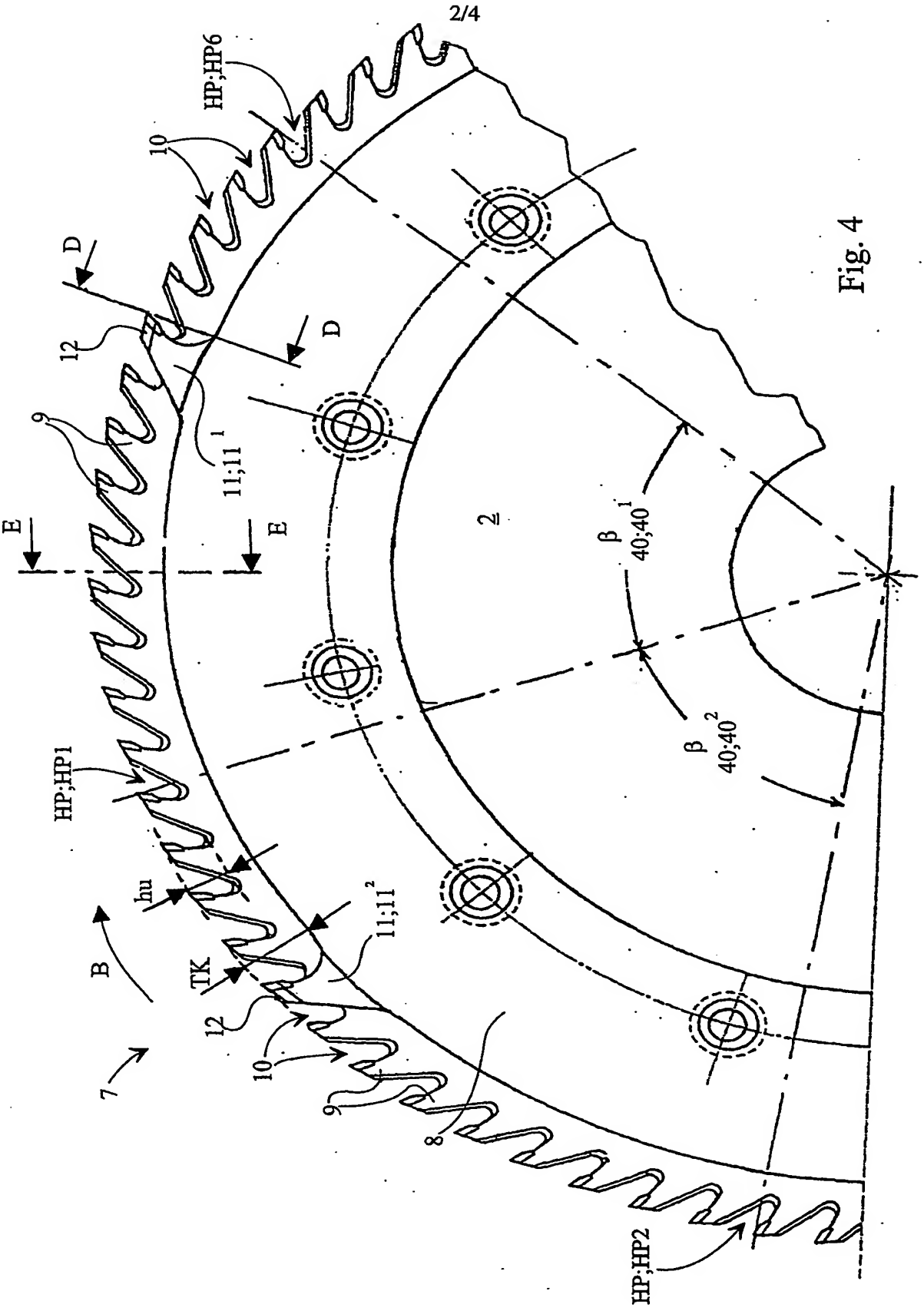
HP;HP6
10
D
12
D
9
11;11 1
E
E
2
β 40;40 1
β 40;40 2
HP;HP1
hu
B
TK
11;11 2
12
10
9
8
7
HP;HP2

Fig. 4

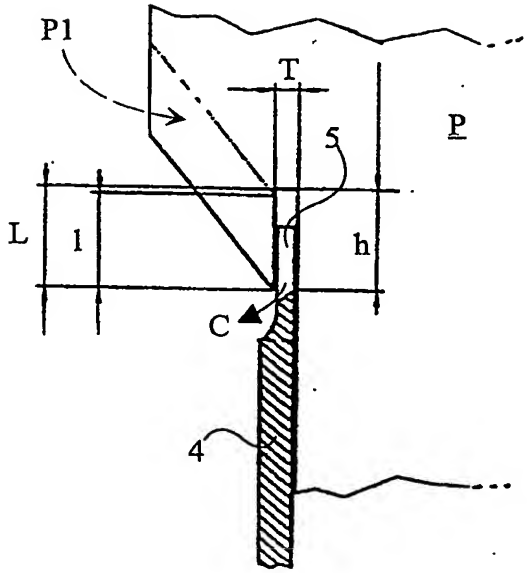

Fig. 3

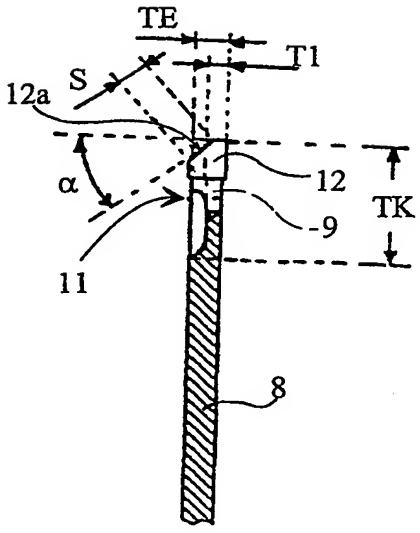

Fig. 5

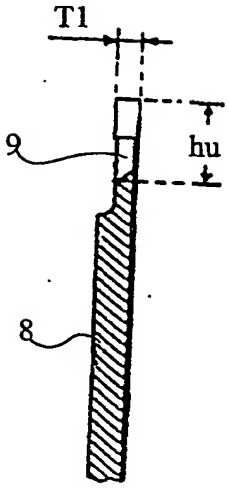

Fig. 6

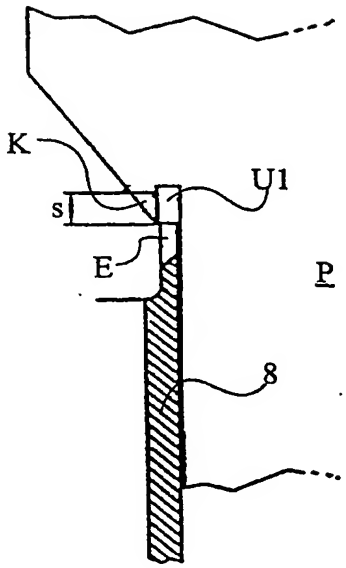

Fig. 7

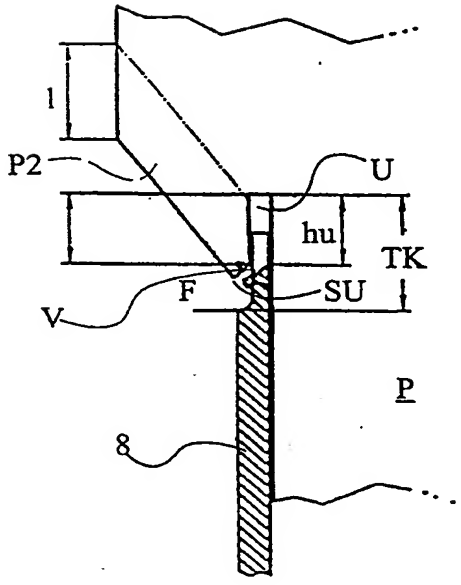

Fig. 8

INTERNATIONAL SEARCH REPORT

International application No.
PCT/FI 01/00408

A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B27B 33/20, B27B 33/08, B27L 11/02
According to International Patent Classification (IPC) or to both national classification and IPC

B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B27L, B27B, B23D

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
Y	DE 1628893 A (NÄPFLIN, HANS), 27 April 1972 (27.04.72), figures 1-4, claims 1-2, abstract	1,3-7
A	--	2
Y	US 4984614 A (ADRIAN L. LANDERS ET AL), 15 January 1991 (15.01.91)	1,3-7
A	--	2
A	US 5983967 A (HERMANN GROSS ET AL), 16 November 1999 (16.11.99), figure 2, abstract	1-7
	--	

☐ Further documents are listed in the continuation of Box C. ☒ See patent family annex.

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"O" document referring to an oral disclosure, use, exhibition or other means
"P" document published prior to the international filing date but later than the priority date claimed
"T" later document published after the international filing date or priority date and not in conflict with the application but cited to understand the principle or theory underlying the invention
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"&" document member of the same patent family

Date of the actual completion of the international search	Date of mailing of the international search report
22 August 2001	24 -08- 2001
Name and mailing address of the ISA/ Swedish Patent Office Box 5055, S-102 42 STOCKHOLM Facsimile No. +46 8 666 02 86	Authorized officer Ola Engstrand/MP Telephone No. +46 8 782 25 00

Form PCT/ISA/210 (second sheet) (July 1998)

INTERNATIONAL SEARCH REPORT

Information on patent family members

02/08/01

International application No.
PCT/FI 01/00408

Patent document cited in search report	Publication date	Patent family member(s)	Publication date
DE 1628893 A	27/04/72	NONE	
US 4984614 A	15/01/91	NONE	
US 5983967 A	16/11/99	AT 173191 T	15/11/98
		CA 2218066 A	17/10/96
		DE 19513699 C	25/04/96
		DE 59600814 D	00/00/00
		DK 820369 T	26/07/99
		EP 0820369 A,B	28/01/98
		SE 0820369 T3	
		NO 974714 A	13/10/97
		WO 9632234 A	17/10/96